



DOE/SC CD-2/3b Review
of the
**Muon to Electron Conversion
Experiment (Mu2e) Project**
Fermi National Accelerator Laboratory
October 21-24, 2014

Kurt Fisher
Committee Chair
Office of Science, U.S. Department of Energy

<http://www.science.doe.gov/opa/>



DOE EXECUTIVE SESSION AGENDA

Tuesday, October 21, 2014—One East (WH1NE)

8:00 a.m.	DOE Executive Session.....	K. Fisher
8:15 a.m.	Program Perspective.....	T. Lavine
8:25 a.m.	Federal Project Director Perspective.....	P. Carolan
8:40 a.m.	Questions	

Project and review information is available at:

<http://mu2e.fnal.gov/public/project/reviews/cd2-review/cd2-index.shtml>

Username: reviewer

Password: mu2ereviewer



Review Committee Participants

Kurt Fisher, DOE/SC, Chairperson

SC1

Accelerator Physics

- * Rod Gerig
- Roy Cutler, ORNL
- Geoff Pile, ANL
- Sasha Zholents, ANL

SC2

Superconducting Solenoids

- * Stephen Gourlay, LBNL
- Ken Marken, DOE/SC
- Bruce Strauss, DOE/SC
- Peter Wanderer, BNL

SC3

Detector Systems

- * William Wisniewski, SLAC
- Howard Gordon, BNL
- Richard Kass, Ohio State
- Jeff Nelson, W&M
- David Nygren, U of Texas, Arlington
- Larry Price, DOE/SC
- Rick Van Berg, U. of Penn

SC4

Civil Construction

- * Jeff Sims, SLAC

SC5

Environment, Safety and Health

- * Ian Evans, SLAC
- Craig Ferguson, SLAC

SC6

Cost and Schedule

- * Jim Krupnick, LBNL
- Jerry Kao, DOE/CH
- Tony Menmona, BNL

SC7

Project Management

- * Don Rej, LANL
- Dan Green, FNAL emeritus
- Lynn McKnight, TJNAF
- Steve Meador, DOE/SC

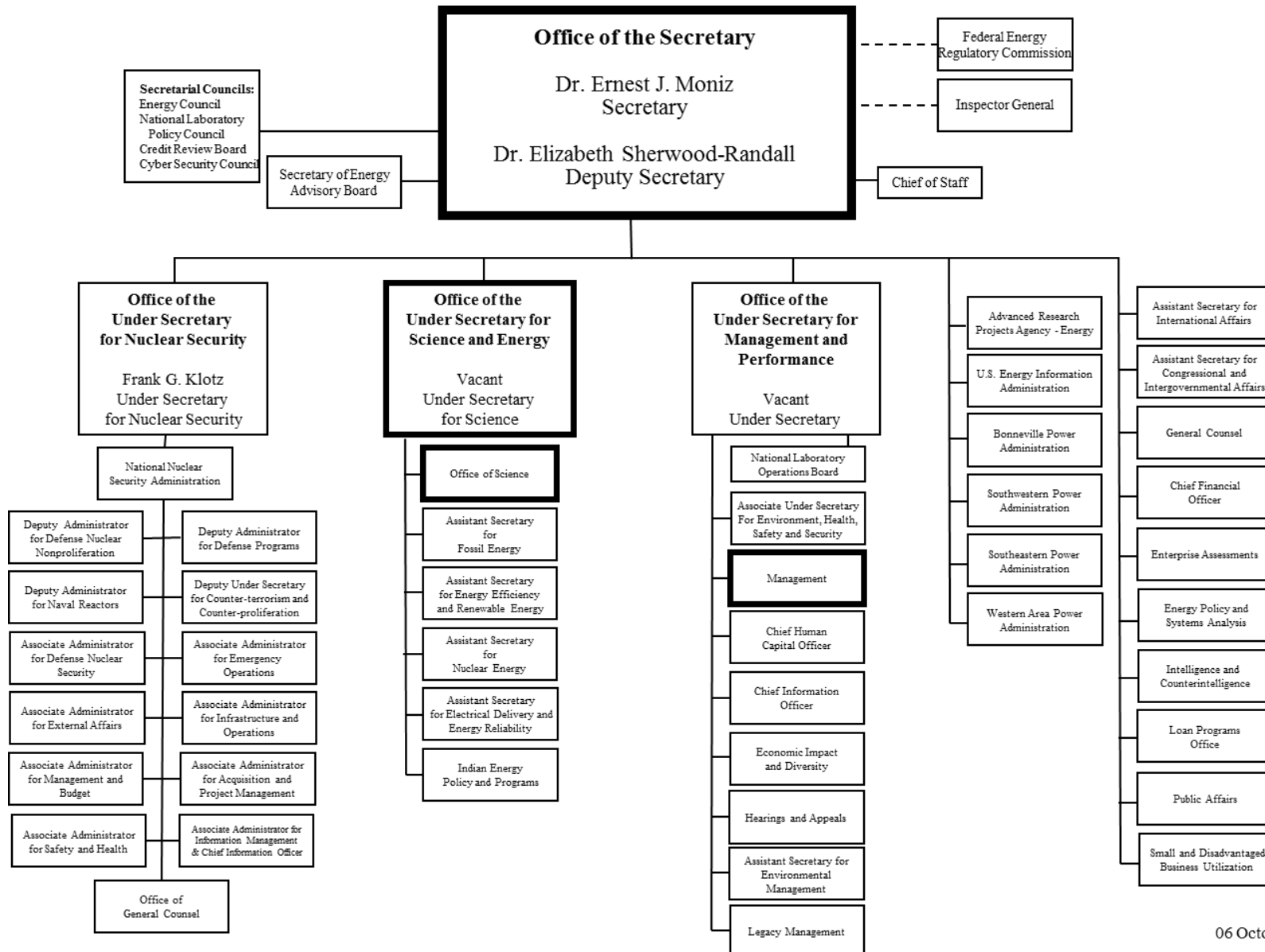
Observers

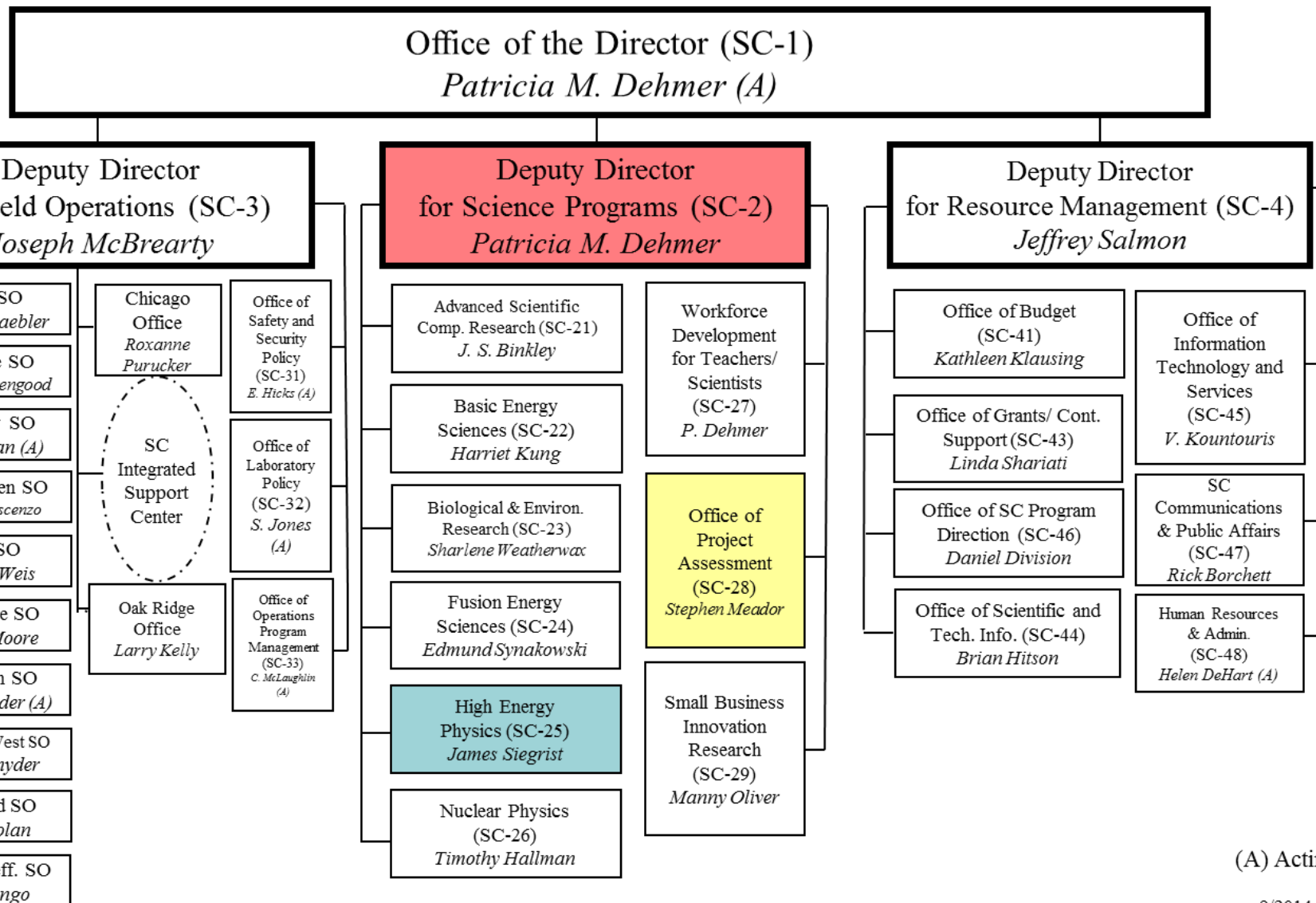
- Mike Procaro, DOE/SC
- Ted Lavine, DOE/SC
- Mike Weis, DOE/FSO
- Pepin Carolan, DOE/FSO
- Paul Philp, DOE/FSO

LEGEND

- SC Subcommittee
- * Chairperson

COUNT: 26 (excluding observers)





(A) Acting



Specific Questions for CD-2:

1. Do the proposed technical design and associated implementation approach satisfy the performance requirements? How has the project team ensured that the subsystems will be fully integrated? Are the CD-4 goals reasonable and well defined?
2. Is the cost estimate and schedule consistent with the plan to deliver the technical scope? Is the contingency adequate for the risk?
3. Are the management structure and resources adequate to deliver the proposed technical scope within the baseline budget and schedule as specified in the PEP?
4. Is the documentation required by DOE Order 413.3B for CD-2 complete?
5. Are ES&H aspects being properly addressed given the project's current stage of development?
6. Has the project responded satisfactorily to the recommendations from the previous independent project review?



CD-2 Matrix

TOTAL PROJECT COST (TPC)		\$750M or more	Less than \$750M to \$400M	Less than \$400M to \$100M	Less than \$100M to \$50M*	Less than \$50M* to \$20M	Less than \$20M to \$10M**
DECISION / REQUIREMENTS ¹ / APPROVAL ²							Delegation Allowed
CD-2--APPROVE PERFORMANCE BASELINE		S-4	SC-1	SC-2	SC-AD	SC-AD	SC-AD
PRIOR TO CD-2--PRELIMINARY DESIGN	Approve updated Acquisition Strategy if changes are major	S-2 (CD-1 to 4 delegated, see below)	SC-1 with SC-28 concurrence	SC-1 with SC-28 concurrence	SC-1 with SC-28 concurrence	SC-AD with SC-28 concurrence	SC-AD with SC-28 concurrence
	Establish a Performance Baseline (PB)	FPD	FPD	FPD	FPD	FPD	FPD
	Approve updated PEP	S-4	SC-1	SC-2	SC-AD	SC-AD	SC-AD
	Prepare a Baseline Fund. Profile & reflect in budget docs. & PEP. Consider full funding if TPC < \$50M	S-4	SC-1	SC-2	SC-AD	SC-AD	SC-AD
	Approval of Long-Lead Procurement	S-4	SC-1	SC-2	SC-AD	SC-AD	SC-AD
	Develop Project Management Plan, if applicable	N/A	N/A	N/A	N/A	N/A	N/A
	Complete Preliminary Design	Project		Project	Project	Project	Project
	Incorporate High Perf. & Sustainable Bldg. & Sustainable Environmental Stewardship	Project	Project	Project	Project	Project	Project
	Conduct a Preliminary Design Review	Team external to project	Team external to project	Team external to project	Team external to project	Team external to project	Team external to project
	Complete Preliminary Design Report	Project	Project	Project	Project	Project	Project
	Perform Baseline Validation Review	ICE by APM with SC-28	ICE by APM with SC-28	ICE by APM with SC-28	SC-28	SC-28	SC-28
	Conduct a Project Definition Rating Index analysis as part of an EIR	N/A	N/A	N/A	N/A	N/A	N/A
	Conduct a Technical Readiness Assessment & develop a Technical Maturation Plan	N/A	N/A	N/A	N/A	N/A	N/A
	Employ an EVMS compliant with ANSI/EIA-748A, or as defined in the contract	Contractor	Contractor	Contractor	Contractor	Contractor	N/A
	Prepare a Hazard Analysis Report	Field Organization (Site Office) or Lab	Site Office or Lab	Site Office or Lab	Site Office or Lab	Site Office or Lab	Site Office or Lab
	Continue with Quality Assurance Program	Site Office or Lab	Site Office or Lab	Site Office or Lab	Site Office or Lab	Site Office or Lab	Site Office or Lab
	Conduct Preliminary Security Vulnerability Assessment, if necessary	Site Office or Lab	Site Office or Lab	Site Office or Lab	Site Office or Lab	Site Office or Lab	Site Office or Lab
	Issue Final NEPA determination (i.e., FONSI)	SC-1 or Site Office	SC-1 or Site Office	SC-1 or Site Office	SC-1 or Site Office	SC-1 or Site Office	SC-1 or Site Office
	Update budget documents and Exhibit 300 if applicable	SC-AD	SC-AD	SC-AD	SC-AD	SC-AD	SC-AD
	Nuclear Facility Hazard Cat. 1,2,3 Nuclear Facility--Update Safety Design Strategy (SDS)	SBAA & FPD, w/CNS or CDNS concurrence, as appropriate	SBAA & FPD, w/CNS or CDNS concurrence, as appropriate	SBAA & FPD, w/CNS or CDNS concurrence, as appropriate	SBAA & FPD, w/CNS or CDNS concurrence, as appropriate	SBAA & FPD, w/CNS or CDNS concurrence, as appropriate	SBAA & FPD, w/CNS or CDNS concurrence, as appropriate
POST CD-2	Hazard Cat. 1,2,3 Nuclear Facility--Prepare a Preliminary Safety Design Report updating the CSDR	SBAA via the PSVR	SBAA via the PSVR	SBAA via the PSVR	SBAA via the PSVR	SBAA via the PSVR	SBAA via the PSVR
	Hazard Cat. 1,2,3 Nuclear Facility--Prepare a Preliminary Safety Validation Report (PSVR)	SBAA	SBAA	SBAA	SBAA	SBAA	SBAA
	Hazard Cat. 1,2,3 Nuclear Facility--Conduct a Technical Independent Project Review	PSO	PSO	PSO	PSO	PSO	PSO
	Hazard Cat. 1,2,3 Nuclear Facility--Place Code of Record under Configuration Control	Project	Project	Project	Project	Project	Project
	Submit approved CD or equivalent documents to APM. If applicable, any PB BCP to APM	SC-28	SC-28	SC-28	SC-28	SC-28	SC-28
	Submit budget request for the remainder of TPC	SC-AD	SC-AD	SC-AD	SC-AD	SC-AD	SC-AD
	Funding profile changes that negatively impact project	S-4	SC-1	SC-2	SC-2	SC-2	SC-2
POST CD-2	Update PARS II with monthly status	Prog. Mgr., FPD, and Contractor	Prog. Mgr., FPD, and Contractor	Prog. Mgr., FPD, and Contractor	Prog. Mgr., FPD, and Contractor	Prog. Mgr., FPD, and Contractor	Prog. Mgr. & FPD No Earned Value (EV)
	Continue with Monthly or Quarterly Project Reporting/Meeting	SC-AD Invite SC-1 and SC-28	SC-AD Invite SC-1 and SC-28	SC-AD Invite SC-2 and SC-28	SC-AD to invite SC-28	SC-AD to invite SC-28	SC-AD to invite SC-28
	SC-AD Request Annual Project Peer Review by PMSO	SC-28	SC-28	SC-28	SC-28	SC-28 Tailored	SC-28 Tailored



Specific Questions for CD-3b:

7. Is the detailed design sufficiently mature so that the project can continue with procurement and fabrication? Has there been adequate progress on the long-lead procurement activities approved under CD-3a?
8. Is the documentation required by DOE Order 413.3B for CD-3b complete?



Tuesday, October 21, 2014—One East (WH1NE)

8:00 am	Executive Session	K. Fisher
8:50 am	Welcome and Fermilab Context— Curia II (WH2SW)	J. Lykken
9:10 am	Project Overview	R. Ray
10:10 am	WBS 2 Accelerator	S. Werkema
10:40 am	Break—Outside Curia II	
11:00 am	WBS 3 Conventional Construction.....	T. Lackowski
11:20 am	WBS 4 Solenoids	M. Lamm
11:50 am	WBS 5 Muon Beamline	G. Ginther
12:20 pm	Lunch—WH2XO	
1:00 pm	Photo for DOE Reviewers—Atrium	
1:20 pm	WBS 6 Tracker— Curia II (WH2SW)	A. Mukherjee
1:40 pm	WBS 7 Calorimeter.....	S. Miscetti
2:00 pm	WBS 8 Cosmic Ray Veto	C. Dukes
2:20 pm	WBS 9 Trigger and DAQ	M. Bowden
2:40 pm	Integration	K. Krempetz
2:55 pm	Break—Outside Curia II	
3:10 pm	<u>Subcommittee Breakout Sessions</u>	
	<ul style="list-style-type: none">• Session 1 Management—One East (WH1NE)• Session 2 Accelerator—Black Hole (WH2NW)• Session 3 Conventional Construction—Snake Pit (WH2NE)• Session 4 Solenoids/Muon Beamline—Racetrack (WH7XO)• Session 5 Calorimeter/Cosmic Ray Veto—Theory (WH3NW)• Session 6 Tracker/DAQ—Comitium (WH2SE)	
5:00 pm	Full Committee Executive Session— One East (WH1NE)	
6:30 pm	Adjourn	



Wednesday, October 22, 2014

8:00 am Subcommittee Breakout Sessions—Continued in same rooms
11:30 am **Lunch—WH2XO**
12:30 pm Subcommittee Breakout Sessions—Continued in same rooms
2:00 pm Response to Reviewer Questions—One East (WH1NE)
3:00 pm **Break—Inside One East (WH1NE)**
3:15 pm Subcommittee Executive Session/Report Writing
4:30 pm Full Committee Executive Session—**One East (WH1NE)**

Thursday, October 23, 2014

8:00 am Subcommittee Breakout Sessions—Continued in same rooms
11:30 am **Lunch—WH2XO**
12:30 pm Subcommittee Breakout Sessions—Continued in same rooms
2:00 pm Response to Reviewer Questions—**Comitium (WH2SE)**
3:00 pm **Break—Inside One East (WH1NE)**
3:15 pm Subcommittee Executive Session/Report Writing
4:30 pm Full Committee Executive Session—**One East (WH1NE)**

Friday, October 24, 2014

8:00 am Subcommittee Working Session—**One East (WH1NE)**
9:30 am Full Committee Executive Session Dry Run/Working Lunch
One East (WH1NE)
11:00 pm Closeout Presentation—**Curia II (WH2SW)**
12:00 pm Adjourn



Executive Summary	Fisher*
1. Introduction	Lavine*
2. Technical Systems Evaluation (Charge Questions 1, 3, 4, 6, 7, 8)	
2.1 Accelerator Physics	Gerig*/SC-1
2.1.1 Findings	
2.1.2 Comments	
2.1.3 Recommendations	
2.2 Superconducting Solenoids	Gourlay*/SC-2
2.3 Detector Systems	Wisniewski*/SC-3
3. Civil Construction (Charge Questions 1, 3, 4, 6, 7, 8)	Sims*/SC-4
4. Environment, Safety and Health (Charge Questions 3, 4, 5, 6, 7, 8)	Evans*/SC-5
5. Cost and Schedule (Charge Questions 1, 2, 3, 4, 6, 7, 8)	Krupnick*/SC-6
6. Project Management (Charge Questions 1, 3, 4, 6, 7, 8)	Rej*/SC-7

*Lead



Closeout Presentation and Final Report Procedures



(Use PowerPoint / No Smaller than 18 pt Font)

2.1 Use Section Number/Title corresponding to writing assignment list.

List Review Subcommittee Members

List Assigned Charge Questions and Review Committee Answers

2.1.1 Findings – What the project told us

- In bullet form, include your account of factual technical, cost, schedule, and management. Information provided/presented by the Project

2.1.2 Comments – What we think about what the project told us

- In bullet form, include your assessment of project status (observations, concerns, feedback, suggestions, etc.) based on the findings. This section carries more emphasis than the Findings, but does not require an action as do the Recommendations. Do not number your comments.

2.1.3 Recommendations – What we think the project needs to do

1. **Beginning with an action verb, provide a brief, concise, and clear statement with a due date.**
- 2.



Format: Final Report

(Use MS Word / 12pt Font)

2.1 Use Section Number/Title corresponding to writing assignment list.

2.1.1 Findings – What the project told us

Include a brief narrative description of technical, cost, schedule, and management information provided by the project. Each subcommittee will emphasize their area of responsibility.

2.1.2 Comments – What we think about what the project told us

Descriptive material assessing the findings and making observations and conclusions based on the findings. **In addition, the committee's answer to the charge questions should be contained within the text of the Comments Section.** Do not number your comments.

2.1.3 Recommendations – What we think the project needs to do

- 1. Beginning with an action verb, provide a brief, concise, and clear statement with a due date.**
- 2.**
- 3.**

Please Note: Recommendations are approved by the full committee and presented at the review closeout briefing. Recommendations SHOULD NOT be changed or altered from the closeout report to the Final Report.



- **Present closeout reports in PowerPoint.**
- **Forward your sections for each review report (in MSWord format) to Casey Clark, casey.clark@science.doe.gov, by Monday, October 27, 8:00 a.m. (EDT).**



**Closeout Report on the
DOE/SC Review of the

Muon to Electron Conversion
Experiment (Mu2e) Project

Fermi National Accelerator Facility
October 21-24, 2014**

Kurt Fisher

Committee Chair

Office of Science, U.S. Department of Energy

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4. Is the documentation required by DOE Order 413.3B for CD-2 complete?
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7. Is the detailed design sufficiently mature so that the project can continue with procurement and fabrication? Has there been adequate progress on the long-lead procurement activities approved under CD-3a?
8. Is the documentation required by DOE Order 413.3B for CD-3b complete?

- **Findings**
- **Comments**
- **Recommendations**



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- **Findings**
- **Comments**
- **Recommendations**



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- **Findings**
- **Comments**
- **Recommendations**



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- **Findings**
- **Comments**
- **Recommendations**



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- **Findings**
- **Comments**
- **Recommendations**



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- **Findings**
- **Comments**
- **Recommendations**



PROJECT STATUS		
Project Type	MIE / Line Item / Cooperative Agreement	
CD-1	Planned:	Actual:
CD-2	Planned:	Actual:
CD-3	Planned:	Actual:
CD-4	Planned:	Actual:
TPC Percent Complete	Planned: _____%	Actual: _____%
TPC Cost to Date		
TPC Committed to Date		
TPC		
TEC		
Contingency Cost (w/Mgmt Reserve)	\$	_____ % to go
Contingency Schedule on CD-4b	_____ months	_____ %
CPI Cumulative		
SPI Cumulative		



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- **Findings**
 - **Comments**
 - **Recommendations**